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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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1. GAS INDUSTRY

Community Education

Palmer, E. L. TOWARD A BETTER UNDERSTANDING. *Public Utilities Fortn.*, 54, 675-8 (1954) November 25.

The importance of this country's human assets and in particular their education is discussed. The program involving scholarships and additional financial aid to the colleges authorized by Pennsylvania Power and Light Company in recognition of its responsibility to the community is described. R. F. Bukacek

Education

PENN STATE OFFERS WIDE VARIETY OF FUEL STUDIES. *Gas*, 30, 39-42, (1954) November.

Since the establishment of curricula in fuel technology and petroleum and natural gas engineering in the early thirties, well over 400 baccalaureate, advanced, and technical degrees have been granted in these departments at Penn State. A description of these programs is given, and it is pointed out that resident instruction, research, and extension courses are offered in both natural gas and fuel technology. Publishers' Abstract

FPC Regulation

Adams, K. S. WILL GAS UTILITIES SIT IDLY BY? *Gas Age*, 114, 36-38, 77, 78 (1954) November 4.

The present regulation of gas sales by producers to the interstate pipe-line companies must be removed, or the national gas market will gradually disappear. The general situation is reviewed by K. S. Adams, Chairman, Phillips Petroleum Company. W. G. Bair

Industry Regulation

Grant, W. C. HOW TO FREE PRODUCERS FROM REGULATION. *Gas Age*, 114, 43-4, 107-09 (1954) October 7.

A report of the highlights of the September 1954 Independant Natural Gas Association meeting. Doubtless the most important item reported concerns a discussion of the impact of the Supreme Court ruling in the Phillips case. R. F. Bukacek

MidSouth Financing

MIDSOUTH EXPANDS WITH UNIQUE SERVICE AGREEMENT. *Gas*, 30, 34, 35, (1954) November.

A description of the planning and promotion required to accomplish the 1954 expansion program of the MidSouth Gas Co. Under this program, eight Arkansas communities will finance construction of facilities to bring natural gas to them; MidSouth will build the system, and on completion, will operate the properties, guaranteeing enough annual income to retire the bonds. Publishers' Abstract

Regulators' Qualifications

Smith, L. PROFESSIONAL QUALIFICATIONS OF FEDERAL REGULATORY COMMISSIONERS. PART I. *Public Utilities Fortn.*, 54, 683-94 (1954) November 25.

The professional background of the federal regulatory commission personnel is reviewed. A trend in recent appointments seems to be established by placing outstanding men from related state agencies in the federal bodies. W. G. Bair

2. APPLIANCES

Appliance Problems

Coleman, S. THE THREE BIG ISSUES. *Gas*, 30, 54-62, (1954) November.

A report of the thoughts of the outgoing president of GAMA. The three most important issues facing the industry today are listed, i.e., (1) the quickest and best way to carry out the Action program, (2) the subnormal earnings situation among gas appliance manufacturers, and (3) the threat of electrical competition to the gas heating load. These, and some of the countermeasures, are discussed. Publishers' Abstract

Gas Heat Pump

Coleman, S. WHY A GAS HEAT PUMP IS ESSENTIAL. *Gas Age*, 114, 20, 54, 55 (1954) November 18.

Increased summer cooling load will put electric distribution companies in an untenable position and force them to sell electric heating to adjust load factors. The heat pump is the logical solution and within a decade G. E. expects to be selling more than 1,000,000 per year at less

than $2,000 per unit. Many millions are going into research on the heat pump, and price reduction and efficient performance in northern climates will surely follow. Large volume heating load is essential to the economic existence of transmission lines and an essential basic policy of the successful gas utility. This load must be protected and one of the most promising approaches seems to be the engine-driven heat pump. R. T. Ellington

Gas Range Sales

GAS RANGE SALES POTENTIAL CHARTED. *Gas Age*, **114**, 25, 55, 56 (1954) November 18.

If economic conditions remain at 1954 level, and product design and sales promotion efforts operate at optimum, a total of 3,200,000 may be sold in 1955. Under these same conditions, 18,400,000 ranges may be sold in 1955-1959.

Editorial Summary

Heat Load Estimates

Ghai, M. L. and Sundaram, R. SELECTION OF OUTSIDE DESIGN TEMPERATURE FOR HEAT LOAD ESTIMATION. *Heating, Piping and Air Conditioning*, **26**, 137-143 (1954) October.

The paper presents a method for accurate estimation of the heat load caused by heat transfer through homogeneous surfaces due to difference between outside and inside air temperatures. The proposed method uses an equation to calculate an equivalent outside design temperature which takes into account both the local weather conditions and the characteristics of the building materials. This gives the actual heat transfer produced by the combined effect of periodic heat transmission and steady state heat transmission. The equivalent outside design temperature, t_D can be used with the equation of the form $q = UA(t_D - t_i)$ to compute the actual heat transfer. The method of determining t_D is given. It is obtained by solving an equation in which known values of maximum (or minimum) and mean temperatures from local weather records, and the material characteristics (density, specific heat, thickness, and conductivity) are substituted. For cooling, the design temperature t_D lies between the daily maximum and daily mean temperatures. For heating t_D lies between the daily minimum and daily mean temperatures. Authors' Abstract

Heating Load

Smith, D. K. HOW ROCHESTER BUILDS LOAD WITH GAS HEAT. *Gas Heat*, **5**, 42, 66 (1954) November: FIVE YEAR GOAL: 25,000 HEATING JOBS. *Gas Age* **114**, 35-37, 72 (1954) December 16.

An account is given of the methods Rochester has used to build load since World War II. During this period, gas was definitely a premium fuel priced at rates from 1½ to 3 times the cost of coal or oil. R. T. Ellington

Refrigeration

Kögel, W. G. (assigned to Aktiebolaget Elektrolux) ABSORPTION REFRIGERATION SYSTEM. U. S. 2,693,090 (1954) November 2.

This patent relates to improvements in the vapor lift operation of the generator in a uniform pressure type of absorption refrigerator.

J. F. Reed

Residential Heating

Carroll, A. L. RESIDENTIAL HEATING—OIL VS GAS. *Am. Gas Assoc. Monthly*, **36**, 19, 20, 51-55 (1954) July-August.

The results of tests made through a whole heating season on a large number of gas and oil fired heating installations of steam, hot water and hot air types show that 22.14 therms of gas are equivalent to 31.5 therms of #2 fuel oil. The tests were made over a sufficiently long time, with a sufficiently large sample to average out quirks of individual tenants, and referred to a common basis so the results should be sound enough to use in sales work. A number of factors contributing to the low relative efficiency of oil are presented. R. T. Ellington

Space Heating

Oettershagen, M. W. ONLY GAS CAN "HEAT ALL OUTDOORS". *Gas Age*, **114**, 19-21 (1954) October 21: *Gas*, 30, 51 (1954) December.

The long and narrow exhibition halls of Chicago's Navy Pier, estimated to have a total heat loss of 38 million Btu/hr. have presented a great heating problem in that 1) available floor space does not permit the use of bulky heating equipment, and 2) intermittent usage of the halls renders it impractical to use a

steam or hot water central heating system. Gas-fired unit heaters have been eventually chosen as the most desirable method of heating. Paper describes lay-out of the buildings, thermal requirement, and construction, installation, and satisfactory operation of the Janitrol heaters adopted. S. Hu

Water Heaters

Pemberton, J. E. RENTALS BUILD WATER HEATING LOAD. *Amer. Gas Assoc. Monthly*, 36, 29-32 (1954) September.

Two month's experience of the Blackstone Valley Gas and Electric Company in renting to tenants, who do not own the tenements, automatic storage-type water heaters, operated either on either regular meter service or on a flat-rate basis, has indicated great possibility of building up water heating load of that area. Installation and sales procedure, and long-range book-keeping details are described.

S. Hu

Pountney, C. H., Jr. ESSENTIAL CHARACTERISTICS AND PROPER INSTALLATION METHODS FOR PROTECTIVE DEVICES FOR DOMESTIC STORAGE-TYPE WATER HEATERS REGARDLESS OF THE ENERGY USED FOR HEATING.
Am. Gas Assoc. Research Rept. No. 1151B (1954) August.

In an attempt to safe-guard domestic storage-type water heaters against hazards due to overheating in case of thermostatic control failures, an inter-industry coordinating committee, consisting of national regulatory organizations and other industries besides the gas industry that are concerned with the problem, has been instituted in 1952 under the auspices of the AGA to investigate, in a cooperative effort, the prevention of water heater hazards. Paper gives detailed discussion of the causes and prevention of hazards as well as the design, installation, and performance of various types of protection devices. Experimental results, both obtained in the AGA Laboratories and reported in the literature, have been analyzed and tentative recommendations regarding choice, installation, and maintenance of the safety devices proposed.

S. Hu

3. COMBUSTION AND INDUSTRIAL FURNACES

Air Conditioning

Waterfill, R. W. AIR CONDITIONING OF MULTI-ROOM BUILDINGS. *Heating, Piping and Air Conditioning*, 26, 141-47 (1954) November.

The characteristics of the principal air handling systems currently used for conditioning multi-room buildings are discussed, with particular analysis of their behavior, supervision and operating costs. Ventilation, air cleaning and humidity variations are treated in some detail. The analysis is applied to an assumed typical office building. J. F. Reed

Air Pollution

Moore, C. E., McCarthy, R., and Logsdon, R. F. A PARTIAL CHEMICAL ANALYSIS OF ATMOSPHERIC DIRT COLLECTED FOR STUDY OF SOILING PROPERTIES. *Heating, Piping and Air Conditioning* 26, 145-148 (1954) October.

A number of atmospheric dirt samples have been collected over American cities and analyzed for free carbon, silica, and mixed oxides. The results of the analyses indicate that there is a wide variation in the composition of the dirt occurring over the various American metropolitan areas. The data also show local variations which appear to be related to such factors as terrain and the economic level of the neighborhood. Details of the sampling procedure are discussed. Authors' Abstract

Carbon Monoxide Toxicity

Minchin, L. T. MILD CARBON MONOXIDE POISONING AS AN INDUSTRIAL HAZARD. *Coke and Gas* (British), 16, 424-436 (1954) November.

The article discusses the physiological effects of mild carbon monoxide poisoning, and records the results of experiments to estimate the amount of carbon monoxide absorbed under different conditions. These tests were based on the determination of the carboxy-hæmoglobin present in the blood and were carried out in gasworks. Author's Abstract

Combustion Research

Townend, D. T. THE MELCHETT LECTURE FOR 1952 "HIGHWAYS AND BY-WAYS IN

COMBUSTION". *J. Inst. Fuel* (British) 27, 534-44 (1954) November.

Lecture reviews the historical developments, including the contribution made by the author and his associates, of the following three major fields of combustion studies: 1) high-pressure explosion phenomena in combustible mixtures, including principles of shock and detonation waves and of V-1 pulse-jet engines; 2) engine knock studies, including theories of mechanism of knock, explosion limits, coal flames and two-stage ignition; and 3) flame stability, including principles of fluid flow and heat transfer, burning velocity, quenching distance, flash-back, and blow-off. S. Hu

Cyclone Furnaces

Sharpe, G. C. THE CYCLONE FURNACE. *Brit. Coal Util. Res. Assoc., Monthly Bull.*, 18, 349-372 (1954) August.

The mechanics of the cyclone furnace as an efficient solid fuel combustor is described in considerable detail, and early developments are traced which lead to its present design. The important advantages of the cyclone combustor in conjunction with steam generation are a) practically complete combustion of the carbon content of the fuel; b) extremely high heat releases up to 500,000 Btu/hr/CF combustor volume; c) continuous removal of a large portion of the coal ash as slag. Flow diagrams and operating results are included. In Jan. 1954 there were 107 cyclone burners on 35 boilers in the USA. Germany had 34 cyclones on 17 boilers in 1954. C. G. von Fredersdorff

Free Piston Turbine

Ramsey, R. P. THE FREE PISTON TURBINE PRIME MOVER. *Gas*, 30, 97-100, (1954) November.

The free piston engine is shown in cutaway views. Also, the control system is very simply explained. An explanation of the principles of operation and a clarification of some of the common misconceptions are presented.

Publishers' Abstract

Furnace Atmospheres

Holcroft, W. FUNDAMENTALS OF GAS CARBURIZING. *Ind. Heating*, 21, 2196-98, 2200, 02, 2364 (1954) November.

The author gives a short discussion of effect of temperature on the equilibrium composition of carburizing atmospheres and the computation of atmosphere composition to give a desired carbon content in the steel. The relations between case depth and carburizing time and surface carbon content and case depth are also covered. R. T. Ellington

Hotchkiss, A. G. THEORY OF FURNACE GAS ATMOSPHERES. *Ind. Heating*, 21, 2212-14, 16, 18, 20, 22, 2348 (1954) November.

The effects or various gases and mixtures on metals are given along with the theoretical equilibria between various gases and steel as a function of temperature. The manner in which carbon potential can be controlled by controlling the dew point of the furnace atmosphere is brought out. R. T. Ellington

Hotchkiss, A. G. and Webber, H. M. MODERNIZING WITH PROTECTIVE ATMOSPHERES. *General Electric Rev.*, 57, 44-47 (1954) November.

The use of protective atmospheres in industrial process furnaces is discussed as regards the function, gases used, and advantages. A gas commonly used for a protective atmosphere is a mixed gas, called an exothermic gas, which is prepared when used by burning natural gas, propane and butane. Of similar composition but more active, is the endothermic gas formed by reacting the fuel gas with air over a catalyst at an elevated temperature. An appreciable number of furnaces being built are equipped with provision for protective atmospheres to control changes on work surfaces being treated.

E. J. Pyrcioch

Peat, Power Fuel

Cronin, W., and Lang, J. F. PEAT-FIRED POWER STATIONS. *J. Inst. Fuel* (British), 27, 545-555 (1954) November.

A brief account of the experience gained and combustion technique employed in using sod peat for the production of electricity as the Port Arlington and Allenwood Stations in Ireland is given. The possibilities of using milled peat in pulverised-fuel-fired boilers are discussed. K. C. Channabasappa

Submerged Combustion

See, W. G. SUBMERGED COMBUSTION EQUIPMENT. *Chem. Eng. Costs Quarterly*, 4, 118-22 (1954) October.

The advantages of submerged combustion, such

as carrying out evaporation at reduced temperature, and the types of burner installations employed are reviewed. The application wherein combustion is carried out at 100 psi. to heat very large volumes of water for sulfur mining is described. R. T. Ellington

Ventilation

Marlow, S. VENTILATION OF COMMERCIAL LAUNDRIES. *Heating, Piping and Air Conditioning*, 26, 149-154 (1954) November.

Laundry ventilation is used to control the heat and moisture released to the workroom. Flatwork ironers are best ventilated by means of local exhaust; washers and press units can, at best, be ventilated by general ventilation. Exhaust volumes have been calculated by means of material and heat balances around ideal systems; these exhaust rates have been tabulated for washers, presses and ironers, and may be used with an appropriate safety factor in estimating the amount of ventilation required in a laundry. Author's Abstract

4. CARBONIZATION AND GASIFICATION

Carbonization

Records, E. H. APPARATUS FOR TREATING AND CALCINING CARBONACEOUS MATERIALS. U. S. 2,689,213 (1954) September 14.

The patent describes the retorts and associated apparatus designed for the calcining and heat treating of various carbonaceous materials for the recovery of useful byproducts from them. Details of construction, combination of parts and the mode of operation of the apparatus are given. It is claimed that the use of this apparatus for thermal treatment of carbonaceous materials insures a more uniform and complete carbonization of the treated material to any desired degree of residual volatile matter.

K. C. Channabasappa

Coal Elasticity

Schuyer, J., Dijkstra, H. and Van Krevelen, D. W. CHEMICAL STRUCTURE AND PROPERTIES OF COAL VII—ELASTIC CONSTANTS. *Fuel* (British), 33, 409-18 (1954) October.

The variation of the elastic constants of coals with the degree of coalification is treated in this extension of the authors studies on coal structure. Elastic constants are calculated from the velocities of propagation of 2 megacycle per sec sound waves through the several pure vitrains. The required two constants for the lower rank isotropic coals and the five for the higher rank anisotropic coals are based upon the constants of the strain-energy function derived from Hooke's generalized law. These also are related to constants expressed as Young's modulus E, shear modulus G, Poisson's ratio *mu*, modulus of compressibility K, and bulk modulus K^{-1}. Plotted against carbon content, the elastic constants (and E and G) fall with decreasing C to a minimum at 90% C, rise to a definite maximum at 85% C, then fall again.

O. P. Brysch

Coal Ion-Exchange

Goedkoop, M. L. (assigned to De Directie van de Staatsmijnen, Netherlands) PREPARATION OF CATION EXCHANGE MATERIAL FROM COAL. U. S. 2,693,452 (1954) November 2.

Cation exchange material is prepared from solid carbonaceous materials by heating the selected granular solid in a free oxygen-containing atmosphere at 220 to 350° C. in rotary-drum or fluidized-type reactors. Then the oxidized product is hydrolyzed by boiling in 1-N aqueous alkaline solution, decanted, and washed with distilled water. O. P. Brysch

Coal Structure

Nelson, J. B. X-RAY STUDIES OF THE ULTRA-FINE STRUCTURE OF COAL II—ATOMIC DISTRIBUTION FUNCTIONS OF VITRINITE FROM BITUMINOUS COALS. *Fuel* (British), 33, 381-93 (1954) October.

By assuming a two-dimensional graphite structure of condensed rings, the X-ray studies of the ultra-fine structure of vitrinites may be explained. These results appear to correlate with the experimental data obtained from the x-ray diffraction photographs with the number of condensed rings per group varying according to the rank of the coal. S. Mori

Effluent Treatment

Egan, P. C. TINGLEY: LIQUOR EFFLUENT TREATMENT PLANT. *Gas World* (British), 140, 1188-94 (1954) November 13.

Initial operating difficulties and their correction

in a plant for complete treatment of gas liquor are discussed. A clean effluent of negligible oxygen absorption properties, for coke quenching or for discharge to streams, and recovery of saleable byproducts was desired. Methods for dephenolation of crude benzole, concentration of ammonia liquor, butyl acetate scrubbing of liquor, crystallization of ammonium chloride and active carbon dephenolization of liquor were studied. Serious gum blockages occurred in the butyl acetate and active carbon plants which finally were abandoned for an air blowing and flocculation system. O. P. Brysch

Enrichment Process

Dean, P. W. (assigned to The Aerogen Company Ltd.) GAS MANUFACTURE. U. S. 2,693,947 (1954) November 9.

Broadly, the present invention comprises a combination of apparatus for vaporizing petrol by the wet carburation method, promoting mixing of the vapor with producer gas, hydrogen or a suitable hydrogen-containing gas such as town gas or coal gas, and extracting the gas-vapor mixture through means, which, by creating turbulence between the gas mixture and a washing liquid, effect washing and further mixing of the gas-vapor mixture. Preferably, the apparatus also includes means for removing water vapor and entrained impurities from the hydrogen-containing gas before substantial mixing with the petrol vapor. Inventor's Abstract

Extraction of Coal

Kirkby, W. A., Lakey, J. R. and Sarjant, R. J. A STUDY OF COAL EXTRACTS BY INFRARED SPECTROSCOPY. *Fuel* (British), 33, 480-496 (1954) October.

This investigation is concerned with the chemical constitution of a wide range of coals including both coking and non-coking coals. The coals are first fractionated by solvent extraction using pryidine aided by an ultrasonic field. The extracts are freed from pyridine and fractionated further by a chromatographic method using a column of activated alumina. The extract is adsorbed on the column, pyridine is removed by washing with n-heptane, and the extract is eluted by chloroform. Infra-red absorption spectra of the elutes show that they may be differentiated by the position and intensity of certain absorption bands. Low-rank bright coals show evidence of a large proportion of aliphatic side chains and oxygen in the form of C=O groups. These features are less evident in high-rank bright coals which may have a more condensed structure. Durains are more similar to the low rank coals.

Authors' Abstract

Gasification

Glazier, E. M. (assigned to Gulf Research and Development Co.) PRODUCTION OF GAS COMPRISING HYDROGEN AND CARBON MONOXIDE. U. S. 2,694,047 (1954) November 9.

The patent describes a process for effecting the carbon-steam reaction in fixed fuel beds at elevated pressure by highly super-heated steam obtained from a coal-fired pebble heater.

C. G. von Fredersdorff

Hubmann, O. PROCESS FOR THE GASIFICATION OF SOLID FUELS. U. S. 2,689,786 (1954) September 21.

The patent describes a combination gasification process consisting of a dilute phase section, for reacting pulverized fuel in suspension with downflowing oxygen and steam, superimposed over a fixed-bed producer section which contains granular fuel reacting with upflowing oxygen and steam. C. G. von Fredersdorff

Robertson, N. J. GASIFICATION PLANT DEVELOPMENTS. *Gas World* (British) 140, 866-69 (1954) October 9.

A brief summary is given of Lurgi pressure gasification and carburetted complete gasification developments including flow diagrams and data. C. G. von Fredersdorff

Hydrogenation

Donath, E. E. FUELS AND CHEMICALS FROM COAL HYDROGENATION. *Ind. Eng. Chem.*, 46, 2032-35 (1954) October.

The paper has outlined the operating conditions in coal hydrogenation that permit recovery of a high yield of pure substances, with particular reference to increasing the production of benzene and phenol, primarily at the expense of fractions like cresols and xylenols for which a large future demand is less certain or from which separation of commercial grade chemicals is difficult. K. C. Channabasappa

Glenn, R. A. COAL HYDROGENATION PROCESS STUDIES IV—EFFECTS OF PRE-HEAT ON RESTRICTED HYDROGENOLYSIS OF PITTSBURGH SEAM COAL. *Fuel* (British) 33, 419-35 (1954) October.

Restricted hydrogenolysis of Pittsburgh seam coal have been made in replicate both with and without preheat in a specially designed rolling-type autoclave equipped within a cold-head receiver under a hot hydrogen pressure of 3000 psi. The pre-heat treatment increases the yields of the low molecular-weight products, particularly gas and distillates, and the very high molecular-weight products (in the soluble residue). K. C. Channabasappa

Lurgi Reactions

Hebden, D. and Foley, K. W. INVESTIGATIONS WITH A SMALL PRESSURE GASIFIER. PART I—THE STUDY OF THE REACTIONS OCCURRING IN THE FUEL BED. Gas Council Res. Commun. GC14 (British) (1954) November.

The gasification of bituminous coal, anthracite and coke in fixed beds was studied in a pilot Lurgi unit to evaluate the effects of fuel characteristics and reactivity toward steam at various oxygen-steam ratios and reactor pressures. Gasification rates ranged from 100-200 lb fuel/hr sq ft, limited primarily by the quantity of dust carry-over from the reactor. At 20 atm. gasification pressure, methane contents in the raw gas were 3% with oven coke, 6% with anthracite and 10% with bituminous coal. The methane content increased to 14% at 40 atm. with bituminous coal. The water-gas shift reaction rapidly approached equilibrium with bituminous coal but not with anthracite or oven coke. Other operating results are presented in graphs of methane content vs fuel-bed depth, steam decomposition vs temperature, temperature vs fuel-bed depth and steam-oxygen ratio vs temperature for slagging and non-slagging operation. C. G. von Fredersdorff

Methanation Process

Sweetser, S. B. (assigned to Standard Oil Development Co.) PRODUCTION OF GAS OF HIGH CALORIFIC VALUE. U. S. 2,694,624 (1954) November 16.

A gas with a heating value in the range 500-700 Btu/SCF is produced from pulverized coal in a two-stage continuous process consisting of a water gas generation operation followed by a methane synthesis step. A fluidized solid operation is employed with a mixture of coal particles and iron oxide catalyst in the methane synthesis reactor. This mixture is then charged to the water gas generator for gasification of the coal with steam and oxygen in the presence of a potasium catalyst. The water gas is passed through the methanation reactor where a portion of the CO and H_2 are synthesized to methane. This process is a modification of patent U.S. 2,694,623. E. J. Pyrcioch

Welty, A. B., Jr., and Sweetser, S. B. PROCESS FOR ENRICHMENT OF WATER GAS (assigned to Standard Oil Development Co.) U.S. 2,694,623 (1954) November 16.

This two-stage continuous process for the production of a water gas rich in methane uses pulverized coal in a fluidized state. Water gas, produced in the lower vessel by gasification of the coal with oxygen and steam, flows upward through a fluidized mixture of coal and iron oxide catalyst in the upper vessel where a portion of the CO and H_2 is synthesized to methane. The fluidized coal from the methane synthesis zone is withdrawn and acts as the charge to the water gas generation zone. With CO_2 removal, the final gas has a heating value up to 500 Btu/SCF. E. J. Pyrcioch

Thermal Analysis

Glass, H. D. INVESTIGATION OF RANK IN COAL BY DIFFERENTIAL THERMAL ANALYSIS. Illinois State Geological Survey Rep. of Inv. No. 171: *Economic Geol.*, 49, 294-309 (1954).

Differential thermal analysis has been used to differential between ranks of coal. Five distinct thermal types have been recognised, the curve type changing when a structural, physical, or chemical change takes place with change in rank. The meta-anthracite type is characterized by a single volatile-loss peak between 725-735° C. and the other at about 620° C. The high-volatile bituminous coals, although exhibiting two peaks, can be differentiated from other ranks by a sharp exothermic reaction superimposed upon the endothermic primary volatilization peak. Differences can be recog-

nized between high-volatile A, B and C coals based on the amplitude of the endothermic peaks. The coals lower in rank than the bituminous are characterised by a large primary volatilization peak at about 45° C. It is claimed that the curves also give a general indication as to the coking ability and the degree of weathering of coals. K. C. Channabasappa

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Chemicals

Maffezzoni, U. ACIDO CIANIDRICO E NITRILE ACRILICO DA METANO. (HYDROGEN CYANIDE AND ACRYLONITRILE FROM METHANE.) *Rivista dei Combustibili* (Italian), 8, 795-803 (1954) November.

Two processes for hydrogen cyanide manufacturing from natural gas are reviewed and discussed. The most interesting direct applications of hydrogen cyanide and its employ in inorganic as well as in organic syntheses are examined. Particular attention is given to the production from ethylene and hydrogen cyanide of acrylonitrile and to its applications. Statistical data are given on the U.S. production of the abovementioned chemicals, and forecasts on the future Italian production of hydrogen cyanide.
Author's Abstract

Compression

Ebdon, J. Fred APPLICATION OF CLOSED TV TO PIPELINE CONTROL HIT OF AGA OPERATING SESSIONS. *Gas*, 30, 53 (1954) November.

A description of a unique demonstration of the integration of closed-circuit, color television into the control system of completely automatic compressor stations. Publishers' Abstract

Ebdon, J. F. SIX YEARS OF OPERATION PROVE THE VALUE OF AUTOMATIC BOOSTER STATION. *Gas* 30, 108-110 (1954) December.

United Gas Pipe Line Co.'s experience at the Dallas junction station has proved the feasibility of using an automatically controlled compressor station as a pressure booster for peak-load demands. Operating advantages and economic savings are pointed out by the author.
Publisher's Abstract

Koenig, C. F. III CENTRIFUGAL PIPELINE COMPRESSORS. *Gas* 30, 100-106 (1954) December.

A technical treatment of the operation, machinery, and performance of centrifugal pipeline compressors, with a look at some present trends in their design for both ultra high- and low-volume gas pumping. Vector diagrams and performance curves are used to illustrate various factors involved. Publisher's Abstract

Dehydration

Traina, G. DISIDRATAZIONE DEL METANO SU ADSORBENTI. (METHANE DEHYDRATION UPON ADSORBENTS) *Rivista dei Combustibili* (Italian), 8, 785-794 (1954) November.

After a short outline of the necessity of natural gas dehydration, and of the several procedures recommended, the characteristics of more important commercial solid adsorbents are described. Particular reference is done to characteristics and adsorption efficiency in static and dynamic conditions, of a silicagel (M) developed at the "Guido Donegani" Research Centre of the "Montecatini" Co. Results obtained in a commercial unit for natural gas dehydration, using the "M" silicagel, are reported.
Author's Abstract

Weil, A. H. ECONOMICS OF MODERN GAS DEHYDRATION. *Gas*, 30, 110-113 (1954) November.

The problem of finding more economical methods for dehydration of gas flowing for long distances into colder climates is pointed up. Four dehydration systems in general use today are described. Advantages and disadvantages encountered with each method are listed. Other factors that influence these operations, such as —plant load factor, operating expense, available dessicants, and saturation limits, are thoroughly discussed. Publishers' Abstract

Gas Cleaning

Wintermute, H. A. (assigned to Research Corp.) GAS CLEANING APPARATUS. U. S. 2,696,-273 (1954) December 7.

An apparatus for the removal of suspended particles from gases by means of a combination of centrifugal and electrical forces is described. The unit consists of a cylindrical shell with a tangential gas inlet and is provided with internal electrodes or a grid which when energized, produce an electrical discharge that precipitates the suspended particles. E. J. Pyrcioch

HOW FRENCH CLEAN GAS IN 380-MI. LINE. *Gas Age*, 114, 35, 58 (1954) November 18.

American gas cleaning equipment is being used to clean compressed coke-oven gas on the newest and longest French gas transmission line. Oil fogging equipment was also supplied.
D. M. Mason

Gas Use

Jones, F. B. TRENDS IN PRODUCTION AND USE OF NATURAL GAS. Am. Soc. Mech. Eng. Paper No. 54-SA-71, Pittsburgh (1954) June 20-24.

The author reviews the recent history of natural gas use, and factors such as post war markets and regulated price which have contributed to the greatly increased use. Load factor, storage, economic and financial problems of production and distribution companies are discussed and the necessity of producing high Btu gas from other fuels in the future is brought out. R. T. Ellington

H_2S Removal

Gilmore, F. E. (assigned to Phillips Petroleum Co.) PROCESS AND APPARATUS FOR CONTROL OF GAS TREATMENT. U.S. 2,-695,836 (1954) November 30.

This invention relates to processes for removing acidic constituents including H_2S from gases. Means are provided for withholding gas from delivery by diverting the gas to an emergency line, when the flow of lean absorption medium falls below the minimum required for purification. D. M. Mason

Griffith, R. H. SULPHUR REMOVAL FROM FUEL GASES BY DRY METHODS. *Gas J.* (British), 280, 254-57 (1954) October 27.

Dry box purification, including chemistry of the process, sources of iron oxide, design of purifiers, methods of operating, and process control are discussed in this first installment.
D. M. Mason

Priestley, J. J. AN OUTLINE OF GAS PURIFICATION. PART IV. *Gas Times* (British), 81, 165-66, 171-72 (1954) October 29.

Removal of H_2S by iron oxide is discussed briefly in this part of the series. D. M. Mason

Priestley, J. J. AN OUTLINE OF GAS PURIFICATION. PART V. *Gas Times* (British), 81, 233, 34, 36, 41 (1954) November 12.

The removal of H_2S by liquid purification and the removal and recovery by oil washing of naphthalene, light oil constituents and the allied constituent CS_2, are briefly discussed in this installment of the series. D. M. Mason

Priestley, J. J. AN OUTLINE OF GAS PURIFICATION. PART VI. *Gas Times* (British), 81, 309-12 (1954) November 26.

Benzene recovery by active carbon, recovery of ammonia from ammonia liquors, gas dehydration, and organic sulfur removal by catalysis are briefly described. D. M. Mason

SHELL'S EXPANSION MEANS MORE SULPHUR FOR TREATING URANIUM ORE. *Can. Chem. Processing*, 39, 60 (1954) October.

The expansion of Shell's natural gasoline and sulfur plant at Jumping Pound, Alberta, is expected to provide sulfur for uranium ore processing in the Lake Athabaska area, 800 miles to the north. D. M. Mason

Line Plug

Tillman, J. M. NEW PLUGGING DEVICE PERMITS ISOLATION OF LINE. *Gas*, 30, 64-68 (1954) November.

A new line-stopping tool that is rated up to 1000-psig is described. The actual application of this device to a job for The Peoples Natural Gas Co., of Pittsburgh, is discussed.
Publishers' Abstract

Methane Reforming

Mills, F. E. and Prigg, J. A. UTILIZATION OF METHANE. Gas Council Res. Comm. GC21 (British) (1954) November.

For the purpose of utilizing methane as town gas, it is found necessary to reduce its calorific value from 994 to 500 Btu/cu ft by diluting with inerts. Calculated Weaver indices indicate that interchangeability with ordinary town gas might be possible for methane mixtures with the following inert: 1) blue water gas, 2) steam-reformed methane produced either catalytically or in the fuel bed of a water gas plant, 3) air-reformed methane, and 4) mixtures of air- and steam-reformed methane. The interchangeability criteria, proposed by Weaver and by Delbourg, are then investigated experimentally for the various methane reforming processes. It is found that satisfactory gases can be made from each of them, provided the specific gravity is kept within certain limits imposed by the tendencies of lifting and incomplete combustion. S. Hu

Pope, J. G. and Richardson, B. FIREDAMP REFORMING. *Gas J.* (British), 280, 395-398 (1954) November 10; *Gas World* (British), 140, 1137-40 (1954) November 6.

A description of British studies on methane reforming with a nickel catalyst on a fire-clay support. The studies were carried out in modified coke ovens and in a tube furnace. The reformed gas was used to mix with methane to produce a send-out gas closely approximating town gas in heating value and burning characteristics. H. A. Dirksen

Romero, M. F. FIRST CATALYTIC PLANT REFORMING NATURAL GAS IN ARGENTINA. *Am. Gas J.*, 181, 26-27 (1954) November.

The history of how the first catalytic reforming plant in Greater Buenos Aires came into existence is presented. H. A. Dirksen

New Pipe Line

AMERICAN LOUISIANA WINS CERTIFICATE IN LAST MINUTE 3-2 EPC DECISION. *Gas*, 30, 95, 115 (1954) November.

The problems relating to gas supply to this newly approved line are brought forth. Basically, the question is raised as to whether producers will honor their contracts with American Louisiana in view of FPC Order 174A.

Publishers' Abstract

Plastic Uses

Bunnell, F. H. PLASTIC PIPE IS GAINING APPROVAL. *Gas Age*, 114, 58-60, 104 (1954) October 7.

Plastic pipe will be adopted or rejected by the gas industry on the basis of its safety record. Here is one company's experience, listing seven special precautions for using it as a liner for low-pressure steel services.

Author's Abstract

Parker, M. E. HOW ABOUT PLASTIC TAPE COATING? *Gas Age*, 114, 31-33 (1954) November 18.

A product of the oil and gas industry, polyethylene is now used as a very efficient pipe coating material. Its peculiar properties such as low conductance and low moisture absorption as well as high dielectric strength and considerable mechanical pliability seem to give a valuable aid to the preservation of the pipe. Besides a brief presentation of the material itself, the article deals mainly with some short-range experiments done by few transmission pipeline companies. Although the tables cover a short length of time, yet they are indicative and encouraging. S. Sensi

Reservoir Sampling

Reudelhuber, F. O. BETTER SEPARATOR SAMPLING OF CRUDE-OIL RESERVOIRS. *Oil Gas J.*, 53, 181, 183 (1954) November 8.

In instances where samples of separator liquid and vapor are recombined to yield a fluid simulating the reservoir fluid and its properties, three requirements must be met before the recombined fluid is representative. First, the produced gas-oil ratio must be representative of the actual gas-oil ratio in the reservoir. Second, this ratio must be accurately determined. Third, the produced fluids must be recombined in proper proportions in the laboratory. Procedures for carrying out the last two are discussed along with the effects of the important variables involved. E. B. Shultz

Safety

HOW PEOPLES NATURAL PROMOTES SAFETY. *Gas Age*, 114, 13, 14, 46-48 (1954) October 21.

The safety program of Peoples Natural Gas Company which as resulted in an outstanding safety record is described. R. F. Bukacek

Safety Code

Hough, F. A. THE GAS INDUSTRY HAS APPROVED ITS NEW SAFETY CODE. *Gas*, 30, 31-33 (1954) November.

The need for a revision of the ASA B31.1 Code, Section 8, is described. It is explained that this is the first code that covers design, construction, operation, and maintenance of gas transmission and distribution systems in the United States. Procedure for changing and obtaining interpretations of the code are given. Some of the more important provisions of the code are discussed. Publishers' Abstract

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Desulfurization

Sandona, O. J. and Rippie, C. W. ELECTRIC MERCAPTAN AND AMINE SALT-H_2S PROCESSES. Petroleum Eng., 26, C43-46 (1954) November.

A new development in the regeneration of caustic soda solutions used for removal of H_2S and mercaptans from gasoline is described, wherein regeneration is accomplished by contacting the solution with atomic oxygen generated in a commercial electrolysis unit from water. An amine salt process for removal of H_2S from liquid hydrocarbon fractions, which is claimed to offer advantages (over ethanolamine processes) of reduced corrosion and reduced loss due to solubility in treated liquid hydrocarbons, is also described briefly. D. M. Mason

Mercaptan Removal

Fiske, C. E. and Miller, R. ECONOMICS OF ADC ELECTROLYTIC MERCAPTAN PROCESS. *Petroleum Eng.*, 26, C48-52, 55 (1954) November.

Cost factors and savings obtainable with the ADC process for removal of mercaptans from gasoline, in which the caustic solution is regenerated by electrolysis, is discussed.

D. M. Mason

Tom, T. B. and Bolt, J. A. (assigned to Standard Oil Co.) MERCAPTAN EXTRACTION PROCESS. U. S. 2,693,442 (1954) November 2.

This invention claims that the heavy mercaptans occurring in heater oil can be extracted by a caustic alkali solution in methanol containing in addition to the methanol a substantial concentration of alkali metal salts of high molecular-weight alkyl phenols, particularly the alkyl phenols of higher molecular weight than xylenol. Preferred phenols are those extracted from the heater oil itself. D. M. Mason

Shale Oil Hydrogenation

Foster, A. L. HYDROGENATION IMPROVES SHALE OIL REFINABILITY. *Petroleum Eng.*, 26, C58, 60 (1954) November.

Coking and hydrogenating shale oil is discussed from the point of view of improving pour point and viscosity, and removing nitrogen, sulfur and oxygen in order to increase product stability. Cobalt molybdate catalyst methods of hydrogenation require outside hydrogen, probably from steam reformation of methane and ethane. The Hyperforming process eliminates this need. The article also considers other methods of refining thermal cracking and acid treatment, which also improve product characteristics. E. B. Shultz

Shale Oil Recovery

Ogorzaly, J. K. and Tyson, C. W. (assigned to Standard Oil Development Co.) VOLATILE FUEL PRODUCTION AND APPARATUS THEREFOR. U. S. 2,689,787 (1954) September 21.

A method is proposed for treatment of carbonaceous solids such as shale whereby the fuel is first preheated and partially devolatilized in a fixed-bed vessel by down-flowing hot combustion products. The preheated fuel is partially burned by air and devolatilized in a second vessel operating at fluidizing conditions.

C. G. von Fredersdorff

Thermal Drive of Reservoir

Hester, D. V. and Menzie, D. E. DEVELOPMENT OF SUBSURFACE COMBUSTION DRIVE. *Petroleum Eng.*, 26, B82, 87, 92 (1954) November.

The application of heat to a reservoir to obtain

increased recovery has been practiced since 1920 in various forms. This rather extensive review discusses the proposed methods, and the field tests carried out since that time.

E. B. Shultz

Turbine Corrosion

Buckland, B. O. CORROSION AND DEPOSIT IN GAS TURBINES. *Ind. Eng. Chem.*, 46, 2163-66 (1954) October.

Gas turbines operating with residual fuel oils are subject to corrosion and slag deposits, due to the action of vanadium and sodium in the ash. A method has been developed for controlling corrosion by sodium sulfate by removing the salt by washing and centrifuging, thus reducing the sodium content in the oil to 4 or 5 ppm. Calcium, which is an inhibitor for vanadium pentoxide corrosion, is also removed in the washing process requiring that another inhibitor be added. Magnesium has been shown to be an effective inhibitor with less tendency for forming deposits than calcium. The tests have resulted in a modification of fuel specifications for turbines. The specifications limit the sodium and calcium in the ash to 5 ppm to reduce deposition rates, and substitute magnesium for calcium as the inhibitor against vanadium pentoxide corrosion.

E. J. Pyrcioch

7. ANALYTICAL METHODS AND TESTS

Chelate Techniques

Martell, A. E. and Chaberek, S. USE OF CHELATING AGENTS AS REAGENTS IN TITRIMETRIC ANALYSIS. *Anal. Chem.*, 26, 1692-96 (1954) November.

Metal ions may be titrated with chelating agents through the formation of metal chelates involving a rapid change of solution properties at the end point. Various methods of detecting the end point are described, including colorimetric and potentiometric determination of pH and metal-iron concentration. D. J. Dennison

Flue Gas Technique

Simpson, R. M. APPARATUS AND TECHNIQUE. *Chem. and Ind.* (British), 46, 1415-16 (1954) November 13.

The Haldane apparatus for the analysis of flue gas has been modified to include a second arm filled with 1% H_2SO_4; all volumes are read by levelling the acid. With the standard pipet, volumes are measured in contact with the KOH and a measurable quantity of CO_2 is absorbed during the levelling operation. The precision is improved by using oxygen in place of air, where the total amount of combustible gas is less than 20%. D. J. Dennison

Infrared Spectrometry

Cumming, A. P. APPLICATION OF INFRARED SPECTROMETRY TO THE ANALYSIS OF COMBUSTION PRODUCTS CONTAINING CARBON DIOXIDE, CARBON MONOXIDE AND SMALL PROPORTIONS OF PROPANE. *J. Appl. Chem.* (British), 4, 561-68 (1954) October.

Although mixtures of CO_2, CO, C_3H_8, and N_2 do not obey Beer's Law, with the correction curves provided, the mixtures can be analyzed (spectrophotometrically) to within 0.4%.

S. A. Weil

Mercaptan Titration

Leisey, F. A. COULOMETRIC TITRATIONS AUTOMATIC TITRATOR FOR MERCAPTANS. *Anal. Chem.*, 26, 1607-09 (1954) October.

An automatic instrument uses a coulometric system for generating silver ions that react with mercaptans in petroleum stocks in alcoholic solutions. At the endpoint, excess silver ions cause an increase in current flow between amperometric electrodes and automatically stop the titration. The amount of silver ions required, determined by the time required to generate them, is a measure, Γ, of the mercaptan content. Better than 2% accuracy is obtained on samples containing over 100 Γ of mercaptan sulfur.

D. J. Dennison

Moisture Determination

Weisbecker, H. B. NEW METER CHECKS MOISTURE BY ELECTRONICS. *Oil Gas J.*, 53, 118 (1954) October 18.

An instrument for the determination of moisture contents of oils and gases is described. The instrument evidently uses a bridge circuit to compare capacitors filled with wet and dry materials. The effects of changing gas temperatures and pressures on such an instrument appear to limit its application. R. F. Bukacek

Particle Size

Beadle, D. G. PHOTOELECTRIC APPARATUS FOR ASSESSING DUST SAMPLES. *Eng. Digest* (Brit.), 15, 428-30 (1954) October. *(J. Chem. Metallurgical and Mining Soc. South Africa*, 55, No. 2, 30-39 (1954) August.

When a beam of light is projected against a collection of dust particles, reflection, scattering and absorption attenuate its transmission. Ways to determine the relationship between the wavelength of light used and size of dust particles, as well as the extinction of light per unit surface area are described together with a coarse layout of the apparatus.

S. Sensi

Petroleum Analysis

Pomatti, R. C., Meeker, R. F., and Levin, H. APPLYING SPECTROSCOPY IN PETROLEUM ANALYSIS-5. *Oil Gas J.*, 53, 97 (1954) November 29.

Very brief review of emission spectrographic applications to and methods used in various petroleum analysis. R. R. Amrine

A. P. I. RESEARCH PROJECT 6: ANALYSIS, PURIFICATION, AND PROPERTIES OF HYDROCARBONS. *Oil Gas J.*, 53, 308, 11, 13, 14 (1954) November 15.

The work of API Research Project 6 devoted to exhaustive analysis of a representative crude oil, and to preparation of pure hydrocarbons for measurement of physical properties and use as standard samples is summarized. Applications of methods of separation including regular distillation, azeotropic distillation, solvent extraction, adsorption, crystallization, and solid molecular complex formation are discussed as are also physical measurements used to follow the course of a separation.

D. M. Mason

A.P.I. RESEARCH PROJECT 48: SULFUR COMPOUNDS IN PETROLEUM. *Oil Gas J.*, 53, 328-30, 33, 34, 37, 40 (1954) November 15.

The work of API Research Project 48 on identification and determination of the sulfur compounds in a typical (Wasson) high-sulfur crude oil, also preparation of pure sulfur compounds for use as standard samples, and measurement and calculation of physical spectrometric, and thermodynamic properties of sulfur compounds is summarized. Amounts of the 43 sulfur compounds found so far in the Wasson crude are tabulated and conclusions are drawn as to the types of compounds present. Developments discussed include methods of separation by adsorption, liquid thermal diffusion, extraction with liquid ammonia, reaction with Raney nickel and with SO_2, formation of complexes with urea and thiourea; methods of analysis including X-ray absorption, polarography; reaction of elemental sulfur with hydrocarbons.

D. M. Mason

8. GENERAL AND PHYSICAL CHEMISTRY

C-O Reactions

Orning, A. A. and Sterling, E. OXYGEN TRANSFER BETWEEN CARBON DIOXIDE AND CARBON MONOXIDE IN THE PRESENCE OF CARBON. *J. Phys. Chem.*, 58, 1044-47 (1954) November.

Radioactive carbon, as $C^{14}O_2$, was employed as a tracer to study oxygen transfer between carbon dioxide and carbon monoxide in the presence of different carbons at 650-900° C. The findings were consistent with the assumed reaction $CO_2 \rightleftarrows (O) + CO$ where the symbol (O) denotes chemically bonded oxygen on the carbon surface. The reaction rate appeared to be dependent as much upon the physical state of the carbon sample as upon the composition and presence of catalytic ingredients. Rate constants and apparent activation energies are presented. C. G. von Fredersdorff

Diffusion

Lee, C. Y. and Wilke, C. R. MEASUREMENTS OF VAPOR DIFFUSION COEFFICIENT. *Ind. Eng. Chem.*, 46, 2381-87 (1954) November.

Diffusion coefficients of binary systems such as hydrocarbons and water in air, in helium, and in Freon-12 were determined by measuring the transfer rate of liquid samples slowly evaporating in a diffusion tube through a gas layer of known depth. C. G. von Fredersdorff

Emission Spectra

Gunn, E. L. NONMETAL ANALYSIS OF MICRO QUANTITIES OF SOLIDS BY EMIS-

SION SPECTRUM. *Anal. Chem.*, 26, 1815-19 (1954) November.

A high voltage condensed spark method (between silver pellets) is described and used for quantitative analysis of bromine, chlorine and sulfur. Average deviation from theoretical values is about 18%. Tables showing have certain factors may effect the signal to noise ratio are given and a table comprising the detected and theoretical percent in various blends of inorganic compounds. R. R. Amrine

Ethylene Compression

Walters, R. J., Tracht, J. H., Weinberger, E. B. and Rodgers, J. K. ETHYLENE COMPRESSIBILITY FACTORS. *Chem. Eng. Progress*, 50, 511-15 (1954) October.

Experimentally determined compressibility factors for ethylene are presented in the pressure range from 50 to 600 psia, at temperatures of 20 to 100° F. A mathematical extrapolation with the use of an equation of state fitting the experimental results is employed to extend the data to −20° F. R. F. Bukacek

Evaporation

Kobayasi, K. THE EVAPORATION VELOCITY OF SINGLE DROPLETS OF LIQUIDS. *Eng. Digest* (British), 15, 463-465 (1954) November.

In order to verify the theoretical results presented by the author in a previous paper, the evaporation rates of single liquid droplets have been determined for twelve pure liquids and five liquid mixtures and petroleum products. The droplet, 0.7 to 1.7 mm in diameter, is suspended from a fine quartz fiber and evaporated in an electric furnace held at the desired temperature. The temperature at the droplet surface and that of the surrounding air are measured by copper-constantan thermocouples and shadowgraphs of the evaporating droplet are taken with a 16-mm motion picture camera through quartz windows on the two sides of the furnace. Results are found to agree excellently with the theoretical relation derived previously:

$$\frac{d(D^2)}{dt} = \text{constant.}$$

Where D and t are the droplet diameter and time respectively. The constant is calculable from the experimental conditions and the thermal properties of the system. S. Hu

H-O Radicals

Robertson, A. J. A MASS SPECTRAL SEARCH FOR H_2O_4 and HO_4 IN A GASEOUS MIXTURE CONTAINING HO_2 and O_2. *Chem. and Ind.* (British) No. 48, 1485 (1954) November 27.

Using a mass spectrometer designed for direct observation of free radicals, the author investigated the reaction of oxygen with hydrogen atoms. Only peroxide compounds and radicals were identifiable as intermediates. No tetraoxide molecules were observed. For details of the spectrometer, one is referred to "Mass Spectrometry", 1954 (London: Methuen) by Robertson. S. A. Weil

H_2S Production

Wilkins, C. W. (assigned to National Container Corp.) PRODUCTION OF HYDROGEN SULFIDE. U. S. 2,694,619 (1954) November 16.

This patent claims that the reaction between calcium oxide or other alkaline earth oxide, sulfur, and water at high temperature to yield H_2S may be accelerated sufficiently for practical amount of sodium or potassium hydroxide to the mixture. H_2S production by this method is particularly suitable for its use in the regeneration of wood-pulp liquor, since the byproducts of the H_2S-producing reaction can be utilized in the normal procedure for cooking liquor recovery. D. M. Mason

Propane Flames

Berlad, A. L. FLAME QUENCHING BY A VARIABLE-WIDTH RECTANGULAR-CHANNEL BURNER AS A FUNCTION OF PRESSURE FOR VARIOUS PROPANE-OXYGEN-NITROGEN MIXTURES. *J. Phys. Chem.*, 58, 1023-26 (1954) November.

Flame quenching distances for a variable-width water-cooled rectangular-channel burner as a function of pressure for various propane-oxygen-nitrogen mixtures are presented. The relation between pressure p and quenching distance d, is given by $d \propto p^{-r}$, with $r = 1$ for equivalence ratios approximately equal to one (for pressures of 0.1 to 1.0 atm. and for volumetric oxygen fractions of the oxidant mixture of 0.17, 0.21, 0.30, 0.50 and 0.70). For lean and stoichiometric mixtures, it is shown that an

equation based on a diffusion mechanism may be used successfully to correlate the observed quenching data. Author's Abstract

Spectrophotometry

Everett, G. W. and Reilley, C. N. COULOMETRIC TITRATIONS WITH PHOTOMETRIC END POINT. *Anal. Chem.*, 26, 1750-1754 (1954) November.

This investigation was undertaken to test the feasibility of using a spectrophotometer to detect end-points in coulometric analyses for the microgram range. A cell and associated apparatus were so constructed that the entire unit fitted into a Beckman B spectrophotometer. Prior to the end-point the absorbance remained at zero. Beyond the end-point the absorbance due to excess iodine changed quickly. The end-point was obtained by plotting time versus absorbance and extrapolating the linear lines to a point of intersection. End-points could be determined easily in the microgram region and results compared favorably with other published results. Authors' Abstract

Surface Diffusion

Bond, R. L. and Murnaghan, A. R. SURFACE DIFFUSION. *Brit. Coal Util. Res. Assoc. Monthly Bull.*, 18, 413-21 (1954) September.

The total flow of fluid through any medium is composed of three types, namely Poiseuille, Knudsen, and surface diffusion. The last type becomes appreciable when the medium is a mass of fine capillaries as exemplified in coal structure and catalysts where the pore diameter is very small. The characteristics and the theoretical aspects of this type of flow is discussed in this article. S. Mori

X-Rays and Welding

Hovland, H. RADIOGRAPHIC INSPECTION ASSURES SOUND PIPELINE WELDS . . . *Oil Gas J.*, 53, 223-25, 228, 230 (1954) November 15.

Use of radiography as an inspection method for pipeline welding has been found effective as a control of weld quality. The X-ray, as compared to isotopes, is the best source because of its sensitivity. Continuous communication of X-ray results to the welding and construction crews enables quick correction of any errors in quality. Sampling and detailed test practice have improved considerably since 1946. Qualifications of the radiographic operator and costs of inspection per weld or per mile should be considered. O. P. Brysch

9. ORGANIC CHEMISTRY

Acetylene Processes

ACETYLENE PROCESS FOR SALE. *Chem. Eng.*, 61, 116-18 (1954) November.

The BASF process for partial oxidation of natural gas for the production of acetylene is described. A flow sheet of the complete process, simplified drawing of the burner and typical process data are included. J. M. Reid

NEW ACETYLENE PROCESS MONITORED BY MASS SPECTROMETER. *Gas*, 30, 47 & 48 (1954) November.

The role played by a continuous process—monitoring mass spectrometer in the Wulff Process method for the production of acetylene is described. Data from Consolidated Engineering Corp.'s Model 21-610 makes it possible to select operating temperatures for any desired yield ratio. Other information gained from the use of this instrument is given.

Publishers' Abstract

Aromatics from Petroleum

Whalley, H. K. AROMATICS FROM PETROLEUM. *Coke and Gas* (British), 363-68, 372 (1954) September.

The reactions involved in reforming and cracking processes are briefly discussed. Important industrial reforming processes (Hydroforming, Platforming) are reviewed, along with the Catarole process for cracking of naphtha. This involves cracking at about 700° C. and 25-50 psig. The liquid product (50-60 wt. percent of feed) is highly aromatic (over 90 percent). The gas yield is largely olefinic. Also two methods for isolation of aromatics from reformates are described, the Udex process which employs diethylene glycol with water as a selective solvent, and the Arosorb process which involves selective adsorption of aromatics by silica gel.

E. B. Shultz

Dehydrogenation

Hornaday, G. F. DEHYDROGENATION BY THE HOUDRY PROCESS. *Petroleum Eng.*, 26, C7-10 (1954) November.

Government plans for the disposal of its synthetic rubber plants have aroused increasing interest in the Houdry dehydrogenation process. In addition to providing an attractive method for producing normal butenes and isobutenes, the Houdry process also constitutes the only commercial single step method for the dehydrogenation of normal butane to butadiene. Many prospective purchasers of the government facilities are investigating the Houdry dehydrogenation process as a method of producing butenes required as feed stocks for most of the government butadiene plants. Considerable interest also has been shown in the use of this process to dehydrogenate isobutane to isobutene which is required for the manufacture of butyl rubber. Author's Introduction

Hydrocarbon Synthesis

Ballard, S. A., Finch, H. De V., and Peterson, E. A. (assigned to Shell Development Co.) SYNTHESIS OF UNSATURATED HYDROCARBONS FROM UNSATURATED KETONES. U. S. 2,693,497 (1954) November 2.

This patent claims the preparation of a methylpentadiene by passing a mixture of mesityl oxide and isopropyl alcohol in vapor phase over a solid zinc oxide-alumina catalyst at 200-500° C. The mole ratio of mesityl oxide to alcohol may vary from one to ten, and flow rates from 0.005 to 0.10 moles of reactants per 100 cc catalyst per minute. E. B. Shultz

Phenol Synthesis

Tonn, W. H., Jr. TODAY'S PROCESSES ARE COMPARED. *Chem. Eng.*, 61, 157-160 (1954) November.

The current supply of synthetic phenol is ahead of the demand, but future requirements are expected to double, or even triple in some cases, in the next few years. A short description of the six processes for the manufacture of phenol is given, including technical and economical data for each process. A list of the major producers is given. E. Mann

10. CHEMICAL ENGINEERING

Catalytic Cracking

Cimino, A., Boudart, M. and Taylor, H. ETHANE HYDROGENATION-CRACKING ON IRON CATALYSTS WITH AND WITHOUT ALKALI. *J. Phys. Chem.*, 58, 796-800 (1954) September.

The kinetics of the hydro-cracking of ethane on iron catalysts with and without alkali additions have been studied. A general expression of the form $-d\,[C_2H_6]/dt = kp^r\,C_2H_6P^sH_2$ has been obtained. The exponent r is 1 or a fraction; s changes from negative to positive as potash is added to fused iron oxides, containing traces of acidic impurities, from which the catalysts were prepared by reduction. A general formulation of the reaction kinetics is presented to include all the data here recorded and earlier work with nickel on the hydro-cracking of ethane and propane. It postulates as a slow step the breaking of a C-C bond by interaction of an adsorbed hydrocarbon radical (C_2H_x) *a* with hydrogen on the surface. The mechanism proposed suggests an interpretation of the role of alkalies in Fischer-Tropsch synthesis on iron catalysts.
Author's Abstract

Catalyst Handling

Wilson, R. C., Jr. (assigned to Socony-Vacuum Oil Co., Inc.) APPARATUS FOR SOLID TRANSFER. U. S. 2,694,039 (1954) November 9.

The patent covers a means of preventing seal steam from condensing in the intake legs of fluid catalyst units by slightly preheating the inlet catalyst. W. G. Bair

Contacting Apparatus

Huggins, C. A. (assigned to Koch Eng. Co., Inc.) APPARATUS FOR CONTACTING GASES AND LIQUIDS. U. S. 2,693,949 (1954) November 9.

A proposed design aimed at improving the plate efficiency of gas-liquid plate contactors by directing part or all of the vapor stream horizontally in the direction of liquid flow on the plates so as to secure more intimate contact between the two fluid streams. Principle is claimed to be applicable to conventional bubble-cap and

sieve-plate columns as well as to a modified baffled-tray tower. Six claims are listed. S. Hu

Turner, N. C. (assigned to Hudson Eng. Corp.) GAS AND LIQUID CONTACT APPARATUS. U. S. 2,693,948 (1954) November 9.

This invention relates to improvements in apparatus for contacting gases and liquids, particularly when contacting as carried out at successively reduced pressure stages. Its object is to provide apparatus for such contacting wherein the energy derived from a decrease in pressure of the predominant stream is utilized to drive the other stream counter-current to the first and hence in the direction of increasing pressure. D. M. Mason

Dehydration

Campbell, J. M. DEHYDRATION OF LIGHT HYDROCARBON LIQUIDS. PART II: REGENERATION METHODS AND DESIGN FACTORS. *Pipe Line Industry*, 1, 90, 92, 94, 96 (1954) November.

The methods of regenerating desicant beds used for dehydrating liquids are described, and factors such as the amount of water to be removed, tower sizing, cycle-length and free-water knockout are discussed. R. F. Bukacek

Extraction Mechanism

Garner, F. H. and Skelland, A. H. MECHANISM OF SOLUTE TRANSFER FROM DROPLETS LIQUID-LIQUID EXTRACTION. *Ind. Eng. Chem.*, 46, 1255-64 (1954) June.

The rate of transfer of acetic acid from single droplets of nitrobenzene to a quiescent water field is found to increase rapidly with the formation time of the drop up to 20 seconds, after which the rate becomes nearly constant. For the same formation time and drop size, the transfer rate increases with decreasing nozzle diameter, probably due to higher linear velocity through the nozzle and hence greater turbulence inside the drop. During the free fall of a droplet, the transfer rate increases with solute concentration, drop size, and degree of oscillation of the drop, but decreases with the length of fall. When changes in concentration along the column are sufficient to produce significant changes in interfacial properties, such as interfacial tension, the rate of transfer will also vary appreciably along the column. S. Hu

Fly Ash Removal

White, H. J. EFFECT OF FLY ASH CHARACTERISTICS ON COLLECTOR PERFORMANCE. Am. Soc. Mech. Eng. Paper No. 54-A-259, New York (1954) November 28.

Concerned primarily with fly ash in effluent gases when burning pulverized coal in furnaces, this paper relates the properties of the fly ash to the design and performance of electrostatic precipitators and indicates the dependence of these properties on the type of coal burned and the furnace design and operation. A general discussion of the properties includes the physical appearance, particle size, carbon content, density, cohesive and adhesive properties and chemical composition of the fly ash. Electrical resistivity of the ash is shown to be the fundamental factor in the performance of the electrostatic precipitator. The critical value of resistivity is about 2×10^{10} ohm-cm, below which satisfactory operation results and above which the performance is poor. The resistivity is governed primarily by the water-soluble or adsorbed sulphate content of the ash, low values indicating high ash resistivity. Basic equations for precipitator design are given. Design is primarily influenced by particle size distributions and electrical resistivity. Combination inertial and electrostatic collections were discussed with arguments in favor and against the use of combination collectors listed. R. T. Ellington

Gas Cooling

Silver, L. A COOLING AND CONDENSING SYSTEM ON A LARGE CARBURETTED WATER GAS PLANT. Gas Council Res. Commun. GC15 (British) November.

A cooling plant designed to handle 18 MMCFD water gas is tested under various load conditions and is found to give very satisfactory performance. The hot gas leaves the set at about 180° F. and is cooled by 4-6° F. in a preheater in which 6,000 gal/hr of boiler feed water is preheated. The remainder of the cooling is done in two stages. The primary cooler is a horizontal serpentine atmospheric condenser which cools the gas to about 140° F., and the two secondary condensers, with vertical water tubes and horizontal gas flow, finally reduce the gas temperature to 60-70° F. A tube-and-shell primary condenser has also been contemplated for future design. S Hu

Gas Flow

Rhea, T. R. QUICK SOLUTIONS TO GAS-FLOW PROBLEMS. *Oil Gas J.*, 53, 125, 127, 129 (1954) September 27.

A description of a slide rule, based on the "Panhandle" flow formula, for solving pressure-drop problems in gas pipelines. Three sample calculations included. S. Hu

Heat Transfer

Deissler, R. G. ANALYSIS OF TURBULENT HEAT TRANSFER, MASS TRANSFER, AND FRICTION IN SMOOTH TUBES AT HIGH PRANDTL AND SCHMIDT NUMBERS. Nat. Adv. Comm. Aeron. Techn. Note 3145 (1954) May.

The expression for eddy diffusivity from a previous analysis was modified in order to account for the effect of kinematic viscosity in reducing the turbulence in the region close to a wall. By using the modified expression, good agreement was obtained between predicted and experimental results for heat and mass transfer at Prandtl and Schmidt numbers between 0.5 and 3000. The effects of length-to-diameter ratio and of variable viscosity were also investigated for a wide range of Prandtl numbers.

Authors' Abstract

Kiln Efficiency

CAPTURING ROTARY KILN HEAT. *Chem. Eng.*, 61, 181-184 (1954) October.

Rising fuel costs are forcing American engineers to secure more efficient heat exchange in rotary kilns. The Fuller system of feed preheat employing cyclones, the Holderbank-Gygi system using gas baffles to induce turbulence and lifters to cascade the nodules of feed through the gas stream, and the Lepol-ACL system using a chain grate to contact feed and exit gas are discussed. With these systems fuel consumptions are reduced from the order of 2,000,000 to about 700,000 Btu/bbl of cement.

R. T. Ellington

Momentum Transport

Alexander, L. G., Baron, T. and Comings, E. W. TRANSPORT OF MOMENTUM, MASS, AND HEAT IN TURBULENT JETS. Univ. Illinois Eng. Exp. Station Bull. Series No. 413.

The Reichardt's hypothesis of momentum transfer has been extended to mass and heat transport in free jets, leading to the general statement: The mean of the product of the radial velocity and a transport property is proportional to the change of the mean of the product of the axial velocity and the transport property with distance along a radius. The extended hypothesis has been found to be in fair agreement with experimental results when the radial velocity is small relative to the axial velocity. Possible fields of application are the evaporation and combustion of liquid droplets in the spray of a jet. S. Hu

Oxygen Removal

Van Krevelen, D. W. (assigned to De Directie Staatsmijnen, Netherlands) PROCESS FOR THE ELIMINATION OF OXYGEN FROM GASES. U. S. 2,693,446 (1954) November 2.

The objective of this patent is to improve the method for eliminating oxygen from gases, by means of washing these gases with an ammoniacal solution of a cuprous compound, in such a manner that the purification can be applied in a continuous process on a technical scale. This is effected by passing the gases through an ammoniacal solution of cuprous compounds and electrochemically regenerating the wash liquid, directly or indirectly, so that the amount of copper in the solution remains constant and no metallic copper need be added.

D. M. Mason

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Heat Exchangers

LOW-FINNED TUBING IN HEAT EXCHANGERS. *Can. Chem. Processing*, 38, 44, 46, 48, 50, 53 (1954) October.

Tests comparing plain and finned tubes show advantages of finned tube units for corrosion and heat transfer performance.

Author's Abstract

Leak Detector

White, W. C. A NEW ELECTRICAL DEVICE TO LOCATE LEAKS OF INFLAMMABLE GASES. *Gas*, 30, 36-38 (1954) November.

A leak detector that uses a phenomenon of increased electrical conductivity with temperature as the principle for operation of the gas-sensitive element is described. The operation,

structural design of the element, electrical characteristics, operation, and sensitivity are detailed. Publishers' Abstract

Meter Covers

Clark, W. W. METER COVERS GAINING IN POPULARITY AMONG DOMESTIC GAS CONSUMERS. *Gas*, 30, 43, 44, (1954) November.

The application of prefabricated meter covers to domestic meter installations is treated. The effects of the covers on the meter and the accuracy of measurement are discussed. Several of the covers available are shown.

Publishers' Abstract

Structural Plastics

REINFORCED PLASTIC EQUIPMENT FOR THE CHEMICAL INDUSTRY. *Can. Chem. Processing*, 39, 54, 56, 58 (1954) October.

A general discussion on uses of process equipment made from reinforced plastics, which is proving itself in several major installations.

S. Volchko

Vacuum Gages

Flosdorf, E. W. THE HIGH-VACUUM STANDARD—THE McLEOD GAGE. *Instr. and Autom.*, 27, 1795-96 (1954) November.

The McLeod Gage, with a built-in chemical trap for vapors, will exclude condensation errors and measure absolute pressure directly and reliably.

A. J. Tulis

Roach, K. MEASUREMENT TECHNIQUE FOR HIGH VACUUM. *Instr. and Autom.*, 27, 1792-94 (1954) November.

The various types of high-vacuum gages available for both mean-free-path and pressure measurements are discussed. Individual characteristics, such as range, cost, accuracy, and continuity of reading, can determine the appropriate gage to be used. A. J. Tulis

Viscosimeter

Hawkins, M. F., Jr. and Kimmel, M. L. A ROTATIONAL HIGH PRESSURE VISCOSIMETER. *J. Petroleum Techn.*, 6, 31-33 (1954) November.

A description of a rotational high-pressure viscosimeter which may have application to the measurement of reservoir oil viscosity.

R. F. Bukacek

12. MATERIALS OF CONSTRUCTION

Concrete Structures

Pilling, A. H. and Boll, M. W. CONCRETE MIXING AND PLACING: 10A: HOW TO PLAN FORMS IN DETAIL. *Construction*, 36, 60-64 (1954) November.

A thorough discussion of the design of form work makes use of the numerous guidance charts revealing technical and practical information. The ties and anchorage devices used are described in this installment. S. Volchko

Corrosion

Brooks, W. B. SEAWATER AS AN INDUSTRIAL COOLANT. PART II. EQUIPMENT EXPERIENCE. *Petroleum Refiner*, 33, 179-82 (1954) November.

Discussion of problems of corrosion control in six types of equipment using sea water as a coolant is based on ten years experience by the Dow Chemical Company. Eleven photographic illustrations. S. Hu

Lloyd, W. G. and Taylor, F. C., Jr. CORROSION BY AND DETERIORATION OF GLYCOL AND GLYCOL-AMINE SOLUTIONS. *Ind. Eng. Chem.*, 46, 2407-16 (1954) November.

Experimental laboratory work on the effect of glycol acidity, addition of alkaline materials, and autoxidation of glycol upon corrosion of steel by diethylene glycol is reported in a first section. Work on corrosion by and deterioration of glycol and glycol-amine solutions, including a review of reported plant experience is given in a second section. Laboratory data on corrosion of steel and aluminum, and effect of solvent polarity on aluminum corrosion, are correlated with plant corrosion. Solution deterioration due to cumulative collection of contaminants such as formic or acetic acid, CS_2 and COS, formation of thiosulfate through reaction of H_2S with trace amounts of O_2, and direct autoxidation of components of the absorbent solution, and effect of salt formation on viscosity of the solution, are discussed. D. M. Mason

Corrosion Inhibitors

Bukowiecki, A. A SURVEY OF CORROSION

INHIBITORS. *Eng. Digest* (British), 15, 425-27 (1954) October; 476-479 (1954) November.

In the first of two installments inhibitors for nearly neutral aqueous solutions are classified and discussed according to the way in which they lend protection, eg., by formation of oxide films, or by cathode inhibition. Main applications of each are outlined. D. M. Mason

The concluding installment contains the remainder of the discussion of inhibitors for nearly neutral aqueous solutions, and discussion of inhibitors for alkaline aqueous solutions, vapor-phase inhibitors, and inhibitors for organic liquids. D. M. Mason

Nickel-Alloy Corrosion

NBS CHARTS EFFECTS OF CORROSION ON VARYING AMOUNTS OF NICKEL IN CAST IRON PIPE. *Gas*, 30, 45 & 46 (1954) November.

The results of a long range study, by the Bureau of Standards, into the corrosion of nickel cast iron pipe in soils, is reported and evaluated. This research program is based on measurements of pipe specimens after exposure to different soil conditions for periods up to eleven years. Publishers' Abstract

LaQue, F. L. CORROSION RESISTANCE OF CUPRONICKEL ALLOYS CONTAINING 10 TO 30 PERCENT NICKEL. *Corrosion*, 10, 391-399 (1954) November.

After outlining the basic homogeneous character of the copper-nickel alloys, the author discusses the theoretical aspects of their corrosion characteristics. Tables and figures outline results of certain tests of the alloys under various stresses and exposed to various environments. Data collected on performance in specific service are then appended, principally in the form of tabulated information, on waters other than salt waters, ammoniacal solutions, brines, alkaline solutions, petroleum products containing hydrogen sulfide, miscellaneous petroleum products, organic compounds, chlorinated solvents, sulfuric acid, halogens and halogen compounds, paper stock suspensions. The article includes 19 references, 5 figures, 15 tables.

Author's Abstract

13. NEW BOOKS

Future Resources

Gustavson, R. G. (President) and Douglas, L. W. (Chairman). THE NATION LOOKS AT ITS RESOURCES: REPORT OF THE MID-CENTURY CONFERENCE ON RESOURCES FOR THE FUTURE. Resources for the Future, Inc., Washington, D. C. $5.00; 418 pp. (1954) November.

Long-range problems of the country's natural resources were explored by the Mid-Century Conference of 1600 specialists held in Washington, December 2-4, 1953. The diverse views upon the broad range of soil, water and mineral resources necessarily are reported only in brief essence, but will be useful in guiding the work of those who will develop and administer the future economy. Thus many issues on which the "present development" school conflicts with the "future heritage" group have been presented, and the need for research, education and cooperation has been acknowledged. The business, farm, labor, education and government views in varying proportions are presented in eight sections. These deal with the problems of 1) competing demands for use of land, 2) utilization and development of land, 3) water resources, 4) non-fuel minerals, 5) energy resources, 6) world resources, 7) resources research, and 8) patterns of cooperation. The opinions of each section are summarized by its chairman. The energy resource section of 225 participants under Chairman Farrington Daniels conferred in three panels which dealt with unconventional sources, electricity and synthetic fuels, and conservation and use. The views expressed in 45 pages of the report are concisely integrated by Chairman Daniels and show how the gas industry's problems interlock with all other energy sources. The dynamic character of the development of energy resources is evidenced by discussions ranging from the mining of coal seams less than 30 inches thick to the use of thorium in reactors. Technological advance has always followed periods of economic fixity in which deep concern with supply has led to willing support for research and development. O. P. Brysch

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American Gas Association Monthly
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American Society of Mechanical Engineers. Transactions
Analytica Chemica Acta
Analytical Chemistry
Appliance Manufacturer
Applied Mechanics Review
Applied Spectroscopy
Association for Computing Machinery, Journal
Australian Journal of Applied Science
Australian Journal of Chemistry

Battelle Technical Review
Bituminous Coal Research
Brennstoff-Chemie
British Coal Utilization Research Association Monthly Bulletin and Quarterly Gazette
Butane-Propane News

California Oil World
Canadian Chemical Processing
Canadian Gas Journal
Canadian Journal of Chemistry
Canadian Journal of Physics
Canadian Journal of Technology
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Coal Heat
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Computers and Automation
Construction Methods and Equipment
Corrosion
Current Chemical Papers (Chem. Soc., London)

Drilling

Electronics
Endeavour
Engineers' Digest
Erdöl und Kohle

Faraday Society. Transactions
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Fuel Abstracts
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Gas and Oil Power
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Gas Journal
Gas News (Chicago)
Gas Council Publications
Gas Times
Gas und Wasserfach
Gas World

Heating, Piping and Air Conditioning

Independent Petroleum Association of America Monthly
Industrial and Engineering Chemistry
Industrial Finishing
Industrial Gas (American)
Industrial Gas (British)
Industrial Heating
Institute of Fuel (British). Journal
Institute of Petroleum (British). Journal
Institute of Gas Technology Publications
Institution of Gas Engineers. Bulletins, Communications and Transactions
Instruments

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Journal des Usines a Gaz
Journal of Applied Chemistry
Journal of Applied Mechanics
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National Fire Protection Association Quarterly
National Gas Bulletin of Australia
National Petroleum News

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Oil and Gas Journal
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THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY